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YELLOW PINE BLISTER RUST

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This rust disease of pine trees—referred to by other common names, such as Eastern gall rust, Southern fusiform rust, pine galls, and pine rust—is very common in Florida and a number of the other Southeastern states. It has been found throughout the United States east of the Rocky Mountains, in the Mexican border states, Canada and Mexico. The wide distribution of the disease is probably accounted for by the fact that it attacks at least eight species of pine trees including those of Southern and Northern range. In Florida it is almost always found on loblolly, slash and longleaf pines, being most common on loblolly.

This disease is of particular interest because the alternate stage is found on 25 or more species of oak trees that have about the same distribution as the pines and include some strictly Southern, Northern or Western species of trees. For the complete development of the rust disease it is necessary for the pines and oaks to grow in the same vicinity, at least within one-half mile of each other. The fungus that causes the disease is a strict parasite and must pass all of its life time, or complete its life cycle, on living pine and oak trees. It is necessary for the fungus to: (a) infect the pine, produce spores on the diseased areas on the pine, which (b) infect the oak, produce spores on the diseased areas on the oak, which (c) in turn infect the pine. Thus spores produced on the pine infect the oak and spores produced on the oak infect the pine. Spores produced on the pine cannot reinfect the pine and will die if there are no oaks in the vicinity.

The fungus lives as a parasite on living pine and oak trees throughout the entire year. The disease is most conspicuous and of most economic importance on the pine trees. Fortunately, the loblolly pine which is most severely attacked is not as valuable a tree as the slash or longleaf and the latter two have not generally been seriously affected. Some infection occurs on them in nature but the most serious losses have been encountered in nurseries where, in certain instances, a 10 percent loss of seedlings resulted the first year and a 20 percent infection persisted in forests set from this nursery after six years. Complete loss of trees occurs when the main trunk becomes infected, especially in the seedling stage. Infection in the nursery is frequent and necessitates careful culling at transplanting time.

The disease appears in the forest annually at about the same seasons each year, varying a few weeks in response to weather conditions. The infections on pines are noticeable in March when they are actively producing orange-colored spores. These spores are carried by the wind and infect the oak leaves that grow within a radius of about one-half mile

of the diseased pine. Infections on the oak produce two kinds of spores: one, called the summer spore, reinfects oak leaves so that from a single infection an oak may become heavily infected during the summer; the other cannot reinfect the oaks but must infect the pines. The pines become infected through the needles during the summer and fall. The fungus grows down the needles into the woody tissue of the twigs where it begins to form a swelling. This swelling develops during the following year and usually produces the bright orange-colored spores the second spring, although spore production may not begin until the third spring. The disease is not serious on oak trees except on severely infected seedlings, since only the leaves become infected. On the pine the fungus stimulates gall production upon the trunks and branches on which spores are produced each year for a number of years.

The disease is caused by the fungus *Cronartium quercuum* (Berk.) Miya., although it is thought that certain types of galls are caused by the fungus *Cronartium fusiforme* (Pk.) Hedgc. & Hunt., a very closely related fungus.

The disease appears characteristically on the trunk and larger branches of pine trees in the form of spherical, oblong or linear gall-like swellings which may completely surround the branch or trunk. In March, yellowish-orange blisters appear on the surface of these galls which rupture and release quantities of dust-like spores. After the spores are shed the surface of the gall becomes smoother as the blisters weather away and it remains inactive, except that it may enlarge somewhat, until the following year when spores are again produced. Infection is less conspicuous on nursery seedlings and often difficult to detect because the only visible symptom is a thickening of the stem anywhere from the soil line to the growing tip. Slight enlargement cannot be easily detected at transplanting time and consequently this early infection is carried to the planted forest. Severely affected seedlings may become yellow and die in the nursery rows. Seedlings killed in this manner usually appear one in a place because the disease cannot spread from one pine seedling to another.

The leaves are the only parts of oaks infected and infection can be detected by the presence of yellowish blotches with or without small brown specks in the centers on the upper surface of the green leaves. On the lower surface of these blotches there appear numerous small blister-like orange-yellow pustules that bear the summer spores that can reinfect oak leaves. Also in these spots are found scattered brown hair-like structures of the fungus. Some are barely visible while others are thick and ¼ inch long and produce the spores that cannot reinfect oak leaves but eventually infect the pines. These spore producing structures can be found on oaks in March and thereafter throughout the summer. No galls similar to those found on pine are produced on the oaks.

The control of yellow pine blister rust is difficult because both of the hosts of the fungus are forest trees. The galls on the pine branches can be removed by pruning annually, which will reduce the spore production and naturally the infection on oaks. This process eventually reduces infection to a minimum, easily within commercial control. Infected pine trees in planted forests can be removed during the thinning operations so that, unless infection is severe, a perfect stand of timber can be produced. In nurseries the application of fungicides has not proven entirely beneficial probably because the applications were not properly timed with the spore production period. Several applications of bordeaux 2-4-50 during February and March in Florida should be beneficial.

The disease can be almost entirely prevented in the seedbed by locating the bed more than one-half mile from the closest oaks. If the above distance cannot be complied with, it would be desirable to remove all infection from pine trees for a considerable distance around the seedbed so as to reduce the infection of oak trees in the vicinity.